

REMARKS/ARGUMENTS

Claims 10-18 are currently pending.

Claim Rejections – 35 USC § 103

Claims 10-18 stand rejected under 35 USC 103(a) as unpatentable over JP-73023405. In order to resolve any dispute as to whether the claims exclude the use of a solvent in the claimed process, Applicants have added an express limitation to claim 1 requiring that “the oligomerization process is solvent-free”. Applicants respectfully submit that the ‘405 reference does not establish a prima facie case of obviousness as to the claimed oligomerization process, namely a process that is (1) **solvent-free** and (2) employs a catalyst comprising boron trifluoride complexed with **an alcohol AND a carboxylic acid**.

In sum, the ‘405 reference teaches polymerization with a catalyst comprising boron trifluoride (BF₃) complexed with an aliphatic alcohol (ROH), an aliphatic ether (ROR’), aliphatic acid (RCOOH), or combinations of two thereof in the presence of a solvent. See e.g., page 3, 3rd full paragraph of the English translation. The ‘405 reference is unequivocal in teaching that a solvent is necessary to obtain superior results:

The invention “is characterized in that this reaction is conducted by using, as solvent, paraffin or part of the low grade propylene polymerization products.”

(page 1, 1st paragraph)

“[T]he use of ... solvent, according to the present invention, makes the yield of dimer ~ tetramer higher, in any conversion ratio, than the case where solvent is not used...” (page 2, 2nd paragraph)

“The aforesaid effect is attributable to the solvent enhancing solubility of the catalyst in the propylene phase.” (page 2, 3rd paragraph)

“The effect of the above solvent can be recognized when using, as a catalyst, any of the boric trifluoride complexes shown below.” (page 3, 3rd paragraph)

“Low grade propylene polymerization process characterized by using, as solvent,...” (page 6, claim 1)

Thus, the overall teaching of the ‘405 reference, when taken as a whole, is that a solvent is required in the oligomerization process.

As noted previously, Applicants have added an express limitation to claim 1 requiring that “the oligomerization process is solvent-free”. In response, the Examiner cites to the examples as disclosing that the oligomerization process can be operated without solvent. However, Applicants respectfully bring to the Examiner’s attention that the solvent free examples of the ‘405 reference are the comparative examples. More specifically, each of examples 1-5 of the ‘405 application was carried out in the presence of solvent and also in the absence of solvent. In each of examples 1-5, the process carried out in the presence of solvent provided superior results in terms of reaction time, monomer conversion, and/or product distribution in comparison to the solvent-free process. Furthermore, the superior results obtained by using solvent are clearly demonstrated by the ‘405 figure, which shows lower monomer conversion in the absence of solvent. In sum, the solvent-free comparative examples relied upon by the Examiner, by demonstrating inferior performance in comparison to solvent based processes, teach away from using a solvent-free process.

Furthermore, none of the comparative examples shows the combination of a solvent-free process with a catalyst comprising boron trifluoride complexed with an alcohol AND a carboxylic acid. Specifically, each of the comparative examples shows solvent-free process with a boron trifluoride complexed with an alcohol, an ether, or a combination of an alcohol and ether

– that is, the comparative examples do not demonstrate the combination of an alcohol and a carboxylic acid. Furthermore, one skilled in the art would not be motivated to modify the comparative examples to employ an alcohol and a carboxylic acid and would not have a reasonable expectation of success upon doing so because the ‘405 reference clearly and unequivocally teaches away from using solvent-free processes, which provide inferior results in comparison to solvent based processes. That is, the purpose of the comparative examples is to show superior results of solvent-based processes in comparison of inferior results of solvent-free processes, and therefore, respectfully, the Examiner’s reliance upon the comparative examples as teaching or suggesting solvent-free processes is misplaced.

In conclusion, Applicants claim an oligomerization process that is (1) solvent-free and (2) employs a catalyst comprising boron trifluoride complexed with an alcohol AND a carboxylic acid. When taken as a whole, the ‘405 reference teaches use of solvent and specifically teaches away from solvent-free processes. Furthermore, the ‘405 reference does not exemplify boron trifluoride complexed with an alcohol and a carboxylic acid. Therefore, Applicants respectfully submit that independent claim 10 and dependent claims 11-18 are not obvious over the prior art of record.


CONCLUSION

Applicants respectfully submit that the present application as amended is in condition for allowance. If the Examiner has any questions or comments or otherwise feels it would be helpful in expediting the application, he is encouraged to telephone the undersigned at (972) 731-2288.

Respectfully submitted,
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